CLAIMS

1. A method of fabricating an electrooptic device, comprising the steps of:

providing a nematic liquid crystal;

providing a photo-curable pre-polymer mixture;

mixing said nematic liquid crystal with said photo-curable pre-polymer mixture to form a homogeneous nematic/pre-polymer mixture, with said nematic liquid crystal being greater than 40% (by weight) of said combined homogeneous mixture;

providing a cell comprising a pair of spaced apart transparent substrates that are each coated with a transparent conductive layer;

filling said cell with said homogeneous nematic/pre-polymer mixture; and

photo-curing said nematic/pre-polymer mixture using a spatially inhomogeneous illumination source thereby creating the electrooptic device in the form of a polymer dispersed liquid crystal (PDLC) exhibiting low scattering loss and high index modulation.

2. The method as defined in claim 1 wherein said nematic liquid crystal possesses a positive dielectric anisotropy.

3. The method as defined in claim 1 wherein said nematic liquid crystal is a eutectic mixture.

4. The method as defined in claim 1 wherein said substrates are separated by approximately 5-20 μm.

5. The method as defined in claim 1 wherein said PDLC is comprised of a dispersion of discrete droplets containing nematic liquid crystal-rich material in a polymer-rich matrix.

6. The method as defined in claim 1 wherein said PDLC is comprised of regions of inter-connected spaces that are filled with nematic liquid crystal-rich material.

7. The method as defined in claim 1 further comprising the step of deriving said spatially inhomogeneous illumination source used to photo-cure the nematic/pre-polymer mixture from the interference of two coherent optical beams within said cell.

8. The method as defined in claim 7 wherein said coherent optical beams each have a wavelength in the ultraviolet spectrum.

9. The method as defined in claim 7 wherein said interfering optical beams are incident symmetrically about a direction normal to said cell in order to form said PDLC as an unslanted PDLC transmission grating.

10. The method as defined in claim 9 wherein said optical beams interfere at such an angle as to form said unslanted PDLC transmission grating with a grating period that is greater than half the wavelength of the light to be diffracted by the PDLC transmission grating during use of said transmission grating.

11. The method as defined in claim 9 wherein said optical beams interfere at such an angle as to form said unslanted PDLC transmaission grating with a spatial frequency that is sufficiently high to prohibit propagating diffracted orders for

normal incident light, thereby creating an electrooptic retarder with electrically tunable birefringence.

12. The method as defined in claim 10 where said nematic liquid crystal in the nematic-rich regions in the PDLC contains a high degree of orientational order and has its nematic director substantially aligned along its grating vector when no drive field is applied across said cell.

13. The method as defined in claim 11 where said nematic liquid crystal in the nematic-rich regions in the PDLC contains a high degree of orientational order and has its nematic director substantially aligned along its grating vector when no drive field is applied across said cell.

14. A method of fabricating a static optical device, comprising the steps of:

providing a nematic liquid crystal;

providing a photo-curable pre-polymer mixture;

mixing said nematic liquid crystal with said photo-curable pre-polymer mixture to form a homogeneous nematic/pre-polymer mixture, with said nematic liquid crystal being greater than 40% (by weight) of said combined homogeneous mixture;

providing a cell comprising a pair of spaced apart transparent substrates;

filling said cell with said homogeneous nematic/pre-polymer mixture; and

photo-curing said nematic/pre-polymer mixture using a spatially inhomogeneous illumination source thereby creating a static optical device in the form of a polymer dispersed liquid crystal (PDLC) exhibiting low scattering loss and high index modulation.

15. The method as defined in claim 14 wherein said subsstrates are separated by approximately 5-20 μm.

16. The method as defined in claim 14 wherein said PDLC is comprised of a dispersion of discrete droplets containing nematic liquid crystal-rich material in a polymer-rich matrix.

17. The method as defined in claim 14 wherein said PDLC is comprised of regions of inter-connected spaces that are filled with nematic liquid crystal-rich material.

18. The method as defined in claim 14 further comprising the step of deriving said spatially inhomogeneous illumination source used to photo-cure the nematic/pre-polymer mixture from the interference of two coherent optical beams within said cell.

19. The method as defined in claim 18 wherein said coherent optical beams each have a wavelength in the ultraviolet spectrum.

20. The method as defined in claim 18 wherein said interfering optical beams are incident symmetrically about a direction normal to said cell in order to form said PDLC as an unslanted PDLC transmission grating.

21. The method as defined in claim 20 wherein said optical beams interfere at such an angle as to form said unslanted PDLC transmission grating with a grating period that is greater than half the wavelength of the light to be diffracted by the PDLC transmission grating during use of said transmission grating.

22. The method as defined in claim 20 wherein said optical beams interfere at such an angle as to form said unslanted PDLC transmission grating with a spatial frequency that is sufficiently high to prohibit propagating diffracted orders for normal incident light, thereby creating a retarder.

23. The method as defined in claim 21 where said nematic liquid crystal in the nematic-rich regions in the PDLC contains a high degree of orientational order and has its nematic director substantially aligned along its grating vector.

24. The method as defined in claim 22 where said nematic liquid crystal in the nematic-rich regions in the PDLC contains a high degree of orientational order and has its nematic director substantially aligned along its grating vector.

25. The method as defined in claim 14 wherein said nematic liquid crystal is a eutectic mixture.